

Test Report

No.TRPVP04108/24B/07

Performance Measurement about mounting bracket

Applicant: **TSUNESS Co., Ltd**
2nd Floor, Building 2, No. 55 Aigehao Road, Weitang Town,
Xiangcheng District, Suzhou City, Jiangsu Province, P.R.China

File No.: PVP04108/24B-07

Designed: by:
(Project Engineer)

Reviewed: by:
(Technical Certifier)

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Applicant..... :	TSUNESS Co., Ltd 2nd Floor, Building 2, No. 55 Aigehao Road, Weitang Town, Xiangcheng District, Suzhou City, Jiangsu Province, P.R.China
Manufacturer (Mounting bracket) :	TSUNESS Co., Ltd 2nd Floor, Building 2, No. 55 Aigehao Road, Weitang Town, Xiangcheng District, Suzhou City, Jiangsu Province, P.R.China
Order No..... :	QT-PVP04108/24B
Date of Application	2024-04-17
Product	Mounting bracket system (Including bracke system, PV module and microinverter)
Mounting bracket system (s)	Mounting bracket system type: TSOL-ESK400-U TSOL-ESK800-U
General Information • Maximum System Voltage.... :	N/A
• Application Class	N/A
• Electrical Protection Class.... :	N/A
• Fire Safety Class	N/A
Type of examination	Commission testing only
Testing Period	2024-05-28 to 2024-05-29
Testing Laboratory..... :	Engineering Research Center of Style of Study in Central South University (For Wind tunnel test only) No.22, South Shaoshan Road, Tianxin District, Changsha City, Hunan Province, P.R. China

Test results listed in this test report refer exclusively to the mentioned test sample.

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Summary of testing

According to the enquiry of the applicant, a commission testing was performed. The wind tunnel test was based on the requirement of applicant.

The testing items are listed in page 7 in this report.

The mounting bracket system type TSOL-ESK800-U and type TSOL-ESK400-U are identical, only different in the type and installation position of the microinverter.

The mounting bracket system type TSOL-ESK800-U combine two types microinverter and two installation position were delivered to testing lab as test samples and conducted with all the related tests.

Speed (m/s)	Duration (min)	conditions	
		the wind direction angle (45°)	the wind direction angle (135°)
0	-	All parts of the sample are installed firmly.	All parts of the sample are installed firmly.
0-36	11-13	With the increase of wind speed, the bracket began to shake slightly, and the PV module vibrated slightly, without damage.	With the increase of wind speed, the bracket began to shake slightly, and the PV module vibrated slightly, without damage.
36	15	The racket began to shake. PV module began to vibrate, without damage.	The racket began to shake. PV module began to vibrate, without damage.
Stop	-	After inspection, the sample has no obvious deformation, and there is no loosening or damage of sample.	After inspection, the sample has no obvious deformation, and there is no loosening or damage of sample.

Conclusion:

1. The test sample is 1 PV module and 2 PV microinverter integrated together. The test sample is slowly loaded at several levels of wind speed and the maximum wind speed (the maximum wind speed of sample is 36m/s,) lasts for 15mins. There is no damage of samples after the two working conditions.

2. This test is completed under laboratory conditions, only considering the effect of wind speed. The incoming wind is in the form of uniform flow, and the wind speed and wind direction are relatively fixed. In the actual environment, the wind may carry rain, debris, sand and dust, and the wind speed may have strong turbulence characteristics, so the vibration or damage conditions may be slightly different from the laboratory conditions.

The wind tunnel test was performed in Engineering Research Center of Style of Study in Central South University.

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General remarks

Test item particulars:	
Accessories and detachable parts included in the evaluation	Bracket and Panel cable ties and bolts
Options included	N/A
Abbreviations used in the report:	
HF - Humidity Freeze	TC - Temperature Cycling
DH - Damp Heat	Vmp - Maximum power voltage
Imp - Maximum power current	Voc - Open circuit voltage
Isc - Short circuit current	FF - Fill factor
Pmax - Maximum power	α - Current temperature coefficient
NOCT - Nominal Operating Cell Temperature	β - Voltage temperature coefficient
STC - Standard Test Conditions	γ - power temperature coefficient
CTI - Comparative Tracking Index	PD - Partial Discharge
Possible test case verdicts:	
Test case does not apply to the test object	Not Applicable (N/A)
Test object does meet the requirement	Pass (P)
Test object does not meet the requirement	Fail (F)
Other remarks:	
<p>The test verdicts presented in this report relate only to the object tested. This report shall not be reproduced except in full, without the written approval of the issuing testing laboratory.</p> <p>“(see Annex #)” refers to additional information appended to the report. “(see Table #)” refers to a table appended to the report.</p> <p>Power degradation data expressed in negative value indicates a reduction of maximum power output. Power degradation data expressed in positive value indicates an increment of maximum power output.</p> <p>Throughout this report, a point is used as the decimal separator.</p>	

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Module group assignment

Mounting bracket system

Sample #	Serial number	Dimension (l x w x h) [mm]	Remark
1	N/A	-	Wind tunnel test 36m/s at 45° and 135°.

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Clause	Requirement + Test	Result - Remark	Verdict
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Test result overview

Module type: TSOL-ESK800-U

Initial examinations			-
-	Visual inspection	See table 10.1	P

Sample 1#

6	<p>Wind tunnel test</p> <p>Install sample according to customer requirement.</p> <p>Turn on the fan and apply wind loads (5m/s, 10m/s, 15m/s, 20m/s, 23m/s, 26m/s, 29m/s, 32m/s, 35m/s, 36m/s) in turn, with a duration of 15 minutes for wind loads: 36m/s. The wind load lasts for 11-13 minutes before reaching the maximum wind speed.</p> <p>Check whether the sample is deformed, vibrated, damaged or loose when the wind direction angle is 135° & 45°, and the installation angle is 35°.</p>	See table 6	N/A
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Final examinations			-
-	Visual inspection	See table 10.1	P

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WIND TUNNEL TEST			
Clause	Requirement + Test	Result - Remark	Verdict

Test results of Wind tunnel test

Mounting bracket system type: TSOL-ESK800-U

Table 10.1 Visual inspection (initial)		-
Test date [YYYY-MM-DD] :	2024-05-28	-
Sample #	Nature and position of findings - comments or attach photos	-
1	No visual defects	P
Supplementary information: N/A		-

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WIND TUNNEL TEST					
Clause	Requirement + Test	Result - Remark			Verdict

Table 6 Wind tunnel test					-
Test date [YYYY-MM-DD] / start - end :	2023-05-28				-
Sample #..... :	1				-
Wind direction angle[°]	45				-
Installation inclination [°]..... :	35				-
Wind velocity [m/s]..... :	5	10	15	20	-
Duration [minute]	0	0	0	0	-
Wind velocity [m/s]..... :	23	26	29	32	-
Duration [minute]	0	0	0	0	-
Wind velocity [m/s]..... :	35	36	-	-	-
Duration [minute]	0	15	-	-	-
Supplementary information: N/A					

Table 6 Wind tunnel test					-
Test date [YYYY-MM-DD] / start - end :	2023-05-29				-
Sample #..... :	1				-
Wind direction angle[°]	135				-
Installation inclination [°]..... :	35				-
Wind velocity [m/s]..... :	5	10	15	20	-
Duration [minute]	0	0	0	0	-
Wind velocity [m/s]..... :	23	26	29	32	-
Duration [minute]	0	0	0	0	-
Wind velocity [m/s]..... :	35	36	-	-	-
Duration [minute]	0	15	-	-	-
Supplementary information: N/A					

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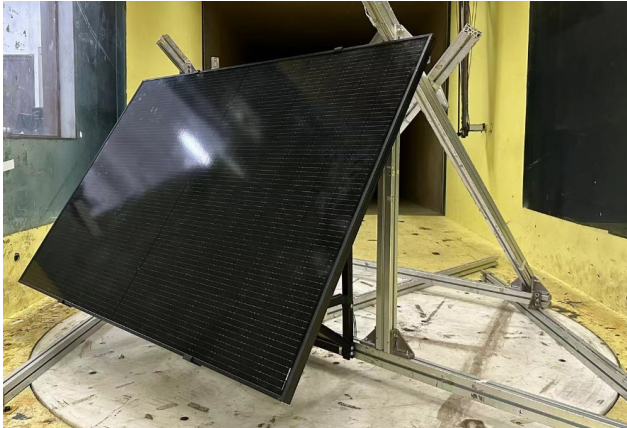
WIND TUNNEL TEST			
Clause	Requirement + Test	Result - Remark	Verdict
Table 10.1 Visual inspection (final)			-
Test date [YYYY-MM-DD] :		2024-05-29	-
Sample #	Nature and position of findings - comments or attach photos		-
1	No visual defects		P
Supplementary information: N/A			-

Annex 1: List of measurement equipment

No.	Equipment	Identification	Next calibration date
1	Digital pressure gauge	GM511-1345602	N/A
2	Wireless strain tester	N/A	N/A

Annex 2: Photos

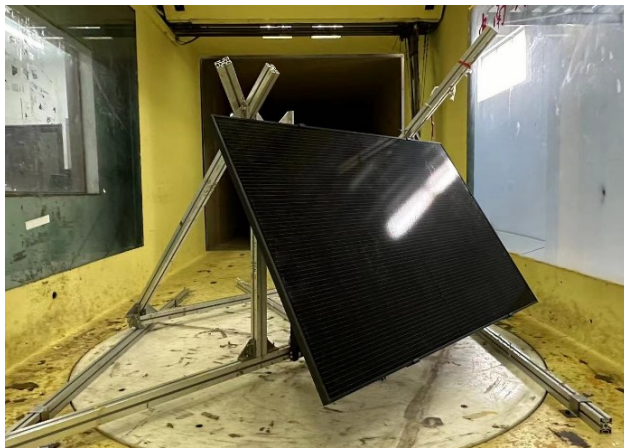
Mounting bracket system type: TSOL-ESK800-U



1# Front
*Wind direction angle 45°
installation inclination: 35°*



1# Rear
*Wind direction angle 45°
installation inclination: 35°*

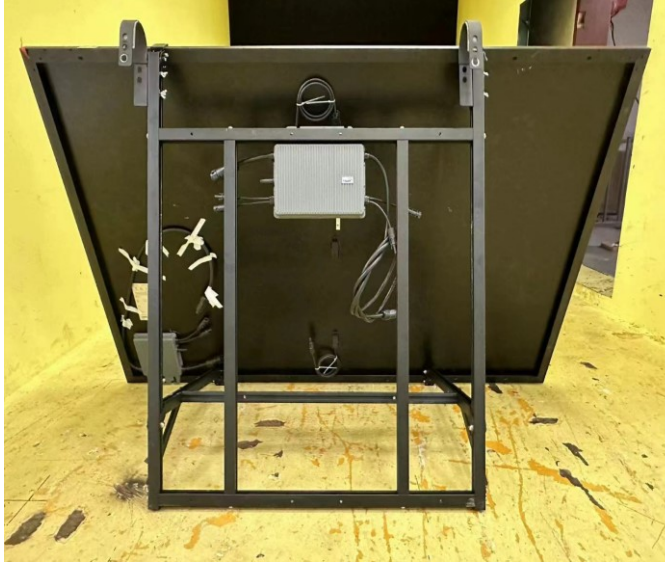


1# Front
*Wind direction angle:135°
installation inclination: 35°*



1# Rear
*Wind direction angle:135°
installation inclination: 35°*

Annex 3: Mounting bracket system



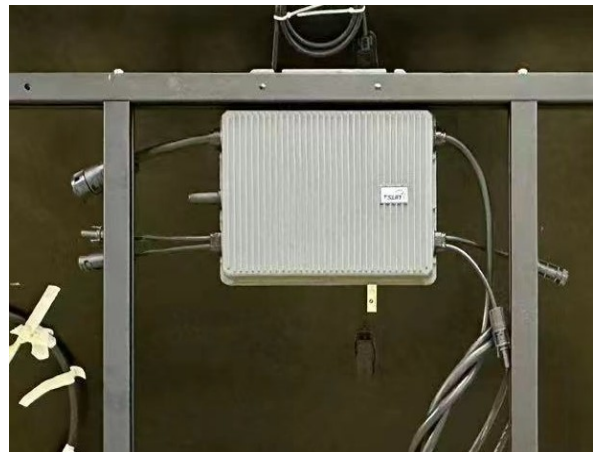
Rear side



Flank side



MS400 for TSOL-ESK400-U

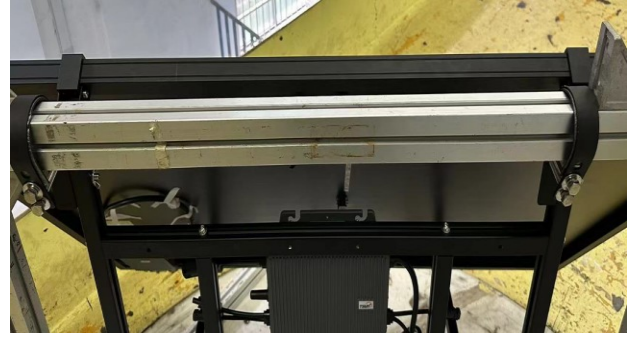


MS800 for TSOL-ESK800-U

Annex 4: Installation method



Panel cable ties fixed



Bracket and bolts fixed



Bracket and bolts fixed



Bracket and bolts fixed

----- End of test report -----